

C L A I M S

1. A transmission power control method characterized in that:

5 reception quality of a signal transmitted from a remote station is compared with a control target value, and the comparison result is used for transmission power control on the remote station; and

10 it is checked whether a frame error exists in the received signal, the control target value is increased if a frame error is detected, and the control target value is gradually decreased if no frame error is detected.

2. A transmission control method characterized in that:

15 a channel is established between a mobile station and a base station, reception quality of a signal transmitted from the base station is compared with a control target value in the mobile station, and the comparison result is used for transmission power control on the base station; and

20 the mobile station checks whether a frame error exists in the received signal, increases the control target value if a frame error is detected, and gradually decreases the control target value if no frame error is detected.

25 3. A transmission control method characterized in that:

a channel is established between a mobile station and a base station, reception quality of a signal transmitted from the mobile station is compared with a control target value in the base station, and the comparison result is
5 used for transmission power control on the mobile station;
and

the base station checks whether a frame error exists in the received signal, increases the control target value if a frame error is detected, and gradually decreases the
10 control target value if no frame error is detected.

4. A transmission power control method characterized in that:

diversity synthesis of signals transmitted from one or a plurality of remote stations is performed, reception
15 quality of a synthesized signal is compared with a control target value, and the comparison result is used for transmission power control on the one or the plurality of remote stations; and

it is checked whether a frame error exists in the
20 synthesized signal, the control target value is increased if a frame error is detected, and the control target value is gradually decreased if no frame error is detected.

5. A transmission power control method characterized in that:

25 a channel is established between a mobile station and

one or a plurality of base stations, the mobile station performs diversity synthesis of signals transmitted from one or a plurality of base stations, reception quality of a synthesized signal is compared with a control target value, and the comparison result is used for transmission power control on the one or the plurality of base stations; and

the mobile station checks whether a frame error exists in the received signal, increases the control target value if a frame error is detected, and gradually decreases the control target value if no frame error is detected.

6. A transmission power control method characterized in that:

a channel is established between a mobile station and one or a plurality of base stations, reception quality of a signal transmitted from the mobile station is compared with a control target value in the one or the plurality of base stations, and the comparison result is used for transmission power control on the mobile station;

each of the one or the plurality of base stations checks whether a frame error exists in the signal, and notifies a control station of the check result; and

the control station uses the check result to determine the presence/absence of a frame in which no

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each of the one or the plurality of base stations increases the control target value if the notified

determination result indicates that there is no frame in which no error is detected, and gradually decreases the control target value if the determination result indicates that there is a frame in which no error is detected.

5 8. A transmission power control method characterized in
that:

a channel is established between a mobile station and one or a plurality of base stations, reception quality of a signal transmitted from the mobile station is compared with a control target value in the one or the plurality of base stations, and the comparison result is used for transmission power control on the mobile station;

each of the one or the plurality of base stations
checks whether a frame error exists in the signal, and
15 notifies a control station of the check result;

the control station determines, on the basis of the check result, the presence/absence of a frame in which no error is detected, and if there is no frame in which no error is detected, notifies each of the one or the plurality of base stations of the determination result; and

each of the one or the plurality of base stations increases the control target value if it is notified of the determination result, and gradually decreases the control target value if it is not notified of the

determination result.

9. A transmission power control method characterized in that:

a channel is established between a mobile station and
5 one or a plurality of base stations, reception quality of
a signal transmitted from the mobile station is compared
with a control target value in the one or the plurality of
base stations, and the comparison result is used for
transmission power control on the mobile station;

10 each of the one or the plurality of base stations
checks whether a frame error exists in the signal, and
notifies a control station of the check result;

the control station notifies the one or the plurality
of base stations of all check results notified from the
15 one or the plurality of base stations or all check results
except for a check result from a self-station; and

each of the one or the plurality of base stations
determines, on the basis of the check result, the
presence/absence of a frame in which no error is detected,
20 increases the control target value if there is no frame in
which no error is detected, and gradually decreases the
control target value if there is a frame in which no error
is detected.

10. A transmission power control method characterized in
25 that:

a control station performs diversity synthesis of signals received from the one or the plurality of base stations, checks whether a frame error exists in a synthesized signal, increases the control target value if a frame error is detected, and gradually decreases the control target value if no frame error is detected.

15 a channel is established between a mobile station and
one or a plurality of base stations, reception quality of
a signal transmitted from the mobile station is compared
with a control target value in the one or the plurality of
base stations, and the comparison result is used for
20 transmission power control on the mobile station;

the control station performs diversity synthesis of
25 reception signals sent from the respective base stations,

each of the one or the plurality of base stations increases the control target value if the check result indicates that a frame error is detected, and gradually decreases the control target value if no frame error is detected.

a channel is established between a mobile station and one or a plurality of base stations, reception quality of a signal transmitted from the mobile station is compared with a control target value in the one or the plurality of base stations, and the comparison result is used for transmission power control on the mobile station;

20 the control station performs diversity synthesis of
reception signals sent from each of the one or the
plurality of base stations, checks whether a frame error
exists in the synthesized signal, and if a frame error is
detected, notifies each of the one or the plurality of
25 base stations of the result; and

each of the one or the plurality of base stations increases the control target value if the notification is received, and gradually decreases the control target value if the notification is not received.

5 13. A transmission power control method according to any
one of claims 1 to 12, characterized in that:

if a frame error is detected, the control target value is increased; and

if no frame error is detected, the control target
10 value is gradually decreased to match channel quality to a
channel quality target value.

14. A transmission power control method according to any one of claims 1 to 12, characterized in that:

if a frame error is detected, the control target
15 value is increased; and

if no frame error is detected, the control target value is gradually decreased to match a frame error rate to a channel quality target value.

15. A transmission power control method according to any
20 one of claims 1 to 12, characterized in that

if a frame error is detected, the control target value is increased by a first predetermined value; and

if no frame error is detected, the control target value is gradually decreased such that the control target value is decreased by the first predetermined value in an

16. A transmission power control method according to any one of claims 1 to 12, characterized in that:

if no frame error is detected, the control target value is gradually decreased such that the control target value is decreased by the first predetermined value while frames fewer than a reciprocal of a channel quality target value based on a frame error rate by one are received.

if a frame error is detected, the control target
15 value is increased by a first predetermined value, and if
no frame error is detected, the control target value is
decreased by a second predetermined value; and

18. A transmission power control method according to any one of claims 1 to 12, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and if
25 no frame error is detected, the control target value is

a ratio of the first predetermined value to the second predetermined value is determined in accordance with a channel quality target value based on a frame error rate.

if a frame error is detected, the control target value is increased by a first predetermined value, and if no frame error is detected, the control target value is decreased by a second predetermined value; and

20. A transmission power control method according to any one of claims 1 to 12, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and if no frame error is detected, the control target value is decreased by a second predetermined value; and

a ratio of the first predetermined value to the second predetermined value is set to a value smaller than a reciprocal of a channel quality target value based on a frame error rate by one.

25 21. A transmission power control method according to any

if a frame error is detected, the control target value is increased by a first predetermined value, and if no frame error is detected, the control target value is decreased by a second predetermined value; and

22. A transmission power control method according to any one of claims 1 to 12, characterized in that:

a product of a channel quality target value based on a frame error rate and the first predetermined value is equal to a product of a value smaller than one by a channel quality target value based on a frame error rate and the second predetermined value.

reception quality of a signal transmitted from a remote station is compared with a control target value, and the comparison result is used for transmission power control on the remote station; and

it is checked whether a frame error exists in the signal, the control target value is increased if a frame error is detected, and the control target value is gradually decreased if no frame error is detected.

5 24. A transmission power control apparatus characterized
in that:

diversity synthesis of signals transmitted from a plurality of remote stations is performed, reception quality of a synthesized signal is compared with a control target value, and the comparison result is used for transmission power control on the plurality of remote stations; and

it is checked whether a frame error exists in the synthesized signal, the control target value is increased if a frame error is detected, and the control target value is gradually decreased if no frame error is detected.

25. A transmission power control apparatus according to a claim 23 or 24, characterized in that:

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        if a frame error is detected, the control target
20  value is increased, and

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if no frame error is detected, the control target value is gradually decreased to match channel quality to a channel quality target value.

26. A transmission power control apparatus according to
25 a claim 23 or 24, characterized in that:

if a frame error is detected, the control target value is increased; and

if no frame error is detected, the control target value is gradually decreased to match a frame error rate
5 to a channel quality target value.

27. A transmission power control apparatus according to a claim 23 or 24, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and

10 if no frame error is detected, the control target value is gradually decreased such that the control target value is decreased by the first predetermined value in an average time during which a frame error is detected when a frame error rate is set to a desired value.

15 28. A transmission power control apparatus according to a claim 23 or 24, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value; and

20 if no frame error is detected, the control target value is gradually decreased such that the control target value is decreased by the first predetermined value while frames fewer than a reciprocal of a channel quality target value based on a frame error rate by one are received.

25 29. A transmission power control apparatus according to a claim 23 or 24, characterized in that:

5 a ratio of the first predetermined value to the
second predetermined value is determined in accordance
with a channel quality target value.

10 if a frame error is detected, the control target
value is increased by a first predetermined value, and if
no frame error is detected, the control target value is
decreased by a second predetermined value; and

31. A transmission power control apparatus according to a claim 23 or 24, characterized in that:

a ratio of the first predetermined value to the
25 second predetermined value is set to a reciprocal of a

32. A transmission power control apparatus according to a claim 23 or 24, characterized in that:

a ratio of the first predetermined value to the second predetermined value is set to a value smaller than a reciprocal of a channel quality target value based on a frame error rate by one.

33. A transmission power control apparatus according to a claim 23 or 24, characterized in that:

a product of a channel quality target value based on a frame error rate and the first predetermined value is set as the second predetermined value.

34. A transmission power control apparatus according to a claim 23 or 24, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and if
25 no frame error is detected, the control target value is

decreased by a second predetermined value; and

a product of a channel quality target value based on a frame error rate and the first predetermined value is equal to a product of a value smaller than one by a channel quality target value based on a frame error rate and the second predetermined value.

35. A mobile station characterized in that:

reception quality of a signal transmitted from a base station is compared with a control target value, and the comparison result is used for transmission power control on the base station; and

it is checked whether a frame error exists in the signal, the control target value is increased if a frame error is detected, and the control target value is gradually decreased if no frame error is detected.

36. A mobile station characterized in that:

diversity synthesis of signals transmitted from one or a plurality of base stations is performed, reception quality of a synthesized signal is compared with a control target value, and the comparison result is used for transmission power control on the one or the plurality of base stations; and

it is checked whether a frame error exists in the synthesized signal, the control target value is increased if a frame error is detected, and the control target value

37. A mobile station according to a claim 35 or 36, characterized in that if a frame error is detected, the control target value is increased, and if no frame error is detected, the control target value is gradually decreased to match channel quality to a channel quality target value.

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10      if a frame error is detected, the control target
      value is increased, and

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15 39. A mobile station according to a claim 35 or 36,
characterized in that:

if no frame error is detected, the control target
20 value is gradually decreased such that the control target
value is decreased by the first predetermined value in an
average time during which a frame error is detected when a
frame error rate is set to a desired value.

40. A mobile station according to a claim 35 or 36,
25 characterized in that:

if no frame error is detected, the control target value is gradually decreased such that the control target value is decreased by the first predetermined value while frames fewer than a reciprocal of a channel quality target value based on a frame error rate by one are received.

10 if a frame error is detected, the control target value is increased by a first predetermined value, and if no frame error is detected, the control target value is decreased by a second predetermined value; and

a ratio of the first predetermined value to the
15 second predetermined value is determined in accordance
with a channel quality target value.

if a frame error is detected, the control target
20 value is increased by a first predetermined value, and if
no frame error is detected, the control target value is
decreased by a second predetermined value; and

a ratio of the first predetermined value to the second predetermined value is determined in accordance with a channel quality target value based on a frame error

43. A mobile station according to a claim 35 or 36,
characterized in that:

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44. A mobile station according to a claim 35 or 36,
characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and if
15 no frame error is detected, the control target value is decreased by a second predetermined value; and

a ratio of the first predetermined value to the second predetermined value is set to a value smaller than a reciprocal of a channel quality target value based on a frame error rate by one.

45. A mobile station according to a claim 35 or 36,
characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and if
25 no frame error is detected, the control target value is

a product of a channel quality target value based on a frame error rate and the first predetermined value is set as the second predetermined value.

10 decreased by a second predetermined value; and

47. A base station characterized in that:

it is checked whether a frame error exists in the signal, the control target value is increased if a frame error is detected, and the control target value is gradually decreased if no frame error is detected.

25 48. A base station characterized in that:

5 it is checked whether a frame error exists in the
signal, and a control station is notified of the check
result; and

49. A base station characterized in that:

15 reception quality of a signal transmitted from a mobile station is compared with a control target value, and the comparison result is used for transmission power control on the mobile station;

a determination result on the presence/absence of a frame in which no error is detected, which is based on the check result, is received from the control station, the control target value is increased if the determination

5 50. A base station characterized in that:

10 it is checked whether a frame error exists in the
signal, and a control station is notified of the check
result; and

the control target value is increased if the base station is notified of the determination result, and the control target value is gradually decreased if the base station is not notified of the determination result.

reception quality of a signal transmitted from a mobile station is compared with a control target value, and the comparison result is used for transmission power control on the mobile station;

25 it is checked whether a frame error exists in the

all check results from the one or the plurality of base stations or all check results except for a check result from the self-station are received from the control station; and

the presence/absence of a frame in which no error is detected is determined on the basis of the check results, the control target value is increased if there is no frame in which no error is detected, and the control target value is gradually decreased if there is a frame in which no error is detected.

reception quality of a signal transmitted from a
15 mobile station is compared with a control target value,
and the comparison result is used for transmission power
control on the mobile station;

20 the control station checks whether a frame error
exists in a signal obtained by diversity synthesis of
reception signals sent from one or a plurality of base
stations, the control target value is increased if a frame
error is detected, the control target value is gradually
25 decreased if no frame error is detected, and the updated


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25         the control station checks whether a frame error

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5 the control target value is increased if the
notification is received, and the control target value is
gradually decreased if the notification is not received.

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10      if a frame error is detected, the control target value
      is increased; and

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15 56. A base station according to any one of claims 47 to
54, characterized in that:

if no frame error is detected, the control target
20 value is gradually decreased to match a frame error rate
to a channel quality target value.

if a frame error is detected, the control target
25 value is increased by a first predetermined value; and

if no frame error is detected, the control target value is gradually decreased such that the control target value is decreased by the first predetermined value in an average time during which a frame error is detected when a frame error rate is set to a desired value.

57. A base station according to any one of claims 47 to 54, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value; and

10 if no frame error is detected, the control target value is gradually decreased such that the control target value is decreased by the first predetermined value while frames fewer than a reciprocal of a channel quality target value based on a frame error rate by one are received.

15 59. A base station according to any one of claims 47 to 54, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and if no frame error is detected, the control target value is decreased by a second predetermined value; and

a ratio of the first predetermined value to the second predetermined value is determined in accordance with a channel quality target value.

20 60. A base station according to any one of claims 47 to 25 54, characterized in that:

5 a ratio of the first predetermined value to the
second predetermined value is determined in accordance
with a channel quality target value based on a frame error
rate.

if a frame error is detected, the control target value is increased by a first predetermined value, and if no frame error is detected, the control target value is decreased by a second predetermined value; and

62. A base station according to any one of claims 47 to 54, characterized in that:

a ratio of the first predetermined value to the
25 second predetermined value is set to a value smaller than

63. A base station according to any one of claims 47 to 54, characterized in that:

10 a product of a channel quality target value based on
a frame error rate and the first predetermined value is
set as the second predetermined value.

64. A base station according to any one of claims 47 to 54, characterized in that:

if a frame error is detected, the control target
15 value is increased by a first predetermined value, and if
no frame error is detected, the control target value is
decreased by a second predetermined value; and

a product of a channel quality target value based on a frame error rate and the first predetermined value is equal to a product of a value smaller than one by a channel quality target value based on a frame error rate and the second predetermined value.

65. A control station characterized in that:

a check result indicating whether a frame error
25 exists in a signal transmitted from a mobile station to

one or a plurality of base stations is received from each of the one or the plurality of base stations; and

the presence/absence of a frame in which no error is detected is determined on the basis of the check result, a control target value for controlling transmission power of the mobile station in the one or the plurality of base stations is increased if there is no frame in which no error is detected, and the control target value is gradually decreased if there is a frame in which no error is detected.

66. A control station characterized in that:

a check result indicating whether a frame error exists in a signal transmitted from a mobile station to one or a plurality of base stations is received from each of the one or the plurality of base stations; and

the presence/absence of a frame in which no error is detected is determined on the basis of the check result, and the one or the plurality of base stations is notified of the determination result to increase a control target value for controlling transmission power of the mobile station in the one or the plurality of base stations if there is no frame in which no error is detected, and to gradually decrease the control target value if there is a frame in which no error is detected.

67. A control station characterized in that:

5 the presence/absence of a frame in which no error is detected is determined on the basis of the check result, and if there is no frame in which no error is detected, each of the one or the plurality of base stations is notified of the determination result, and

68. A control station characterized in that:

each of the one or the plurality of base stations is notified of all check results sent from the one or the plurality of base stations or all check results except for a check result from the self-station; and

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diversity synthesis of reception signals sent from the one or the plurality of base stations is performed, it is checked whether a frame error exists in the synthesized signal, and the one or the plurality of base stations is notified of the check result; and

5 control target value is gradually decreased if no frame
error is detected.

71. A control station characterized in that:

signals from a mobile station are received by one or a plurality of base stations;

10 diversity synthesis of reception signals sent from
the one or the plurality of base stations is performed, it
is checked whether a frame error exists in the synthesized
signal, and if a frame error is detected, the one or the
plurality of base stations is notified of the result; and

15 a control target value for controlling transmission power of the mobile station which each of the one or the plurality of base stations has is increased if the notification is received, and the control target value is gradually decreased if the notification is not received.

20 72. A control station according to any one of claims 65
to 71, characterized in that:

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        if a frame error is detected, the control target
value is increased; and

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if no frame error is detected, the control target
25 value is gradually decreased to match channel quality to a

73. A control station according to any one of claims 65 to 71, characterized in that:

if no frame error is detected, the control target value is gradually decreased to match a frame error rate to a channel quality target value.

if a frame error is detected, the control target value is increased by a first predetermined value; and

75. A control station according to any one of claims 65 to 71, characterized in that:

if no frame error is detected, the control target value is gradually decreased such that the control target value is decreased by the first predetermined value while frames fewer than a reciprocal of a channel quality target

76. A control station according to any one of claims 65 to 71, characterized in that:

a ratio of the first predetermined value to the second predetermined value is determined in accordance with a channel quality target value.

77. A control station according to any one of claims 65 to 71, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and if
15 no frame error is detected, the control target value is decreased by a second predetermined value; and

a ratio of the first predetermined value to the second predetermined value is determined in accordance with a channel quality target value based on a frame error rate.

78. A control station according to any one of claims 65 to 71, characterized in that:

if a frame error is detected, the control target value is increased by a first predetermined value, and if
25 no frame error is detected, the control target value is

a ratio of the first predetermined value to the second predetermined value is set to a reciprocal of a channel quality target value based on a frame error rate.

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a ratio of the first predetermined value to the second predetermined value is set to a value smaller than a reciprocal of a channel quality target value based on a frame error rate by one.

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a product of a channel quality target value based on a frame error rate and the first predetermined value is set as the second predetermined value.

81. A control station according to any one of claims 65
25 to 71, characterized in that:

5 a product of a channel quality target value based on
a frame error rate and the first predetermined value is
equal to a product of a value smaller than one by a
channel quality target value based on a frame error rate
and the second predetermined value.

a signal-to-interference ratio of a signal transmitted from a remote station is compared with a signal-to-interference ratio reference value, every time a slot is received, and a control instruction is generated and transmitted to the remote station;

the signal-to-interference ratio reference value is increased by SIRinc if a frame error is detected, the
25 signal-to-interference ratio reference value is decreased

by SIRdec if no frame error is detected, and a product of a target value of a frame error rate and SIRinc is set as SIRdec.

83. A transmission power control method characterized in that:

a signal-to-interference ratio of a signal transmitted from a remote station is compared with a signal-to-interference ratio reference value, every time a slot is received, and a control instruction is generated and transmitted to the remote station;

the remote station updates, every time a control instruction is received, transmission power in accordance with the control instruction, and every time a frame containing error detection information is received from the remote station, it is checked whether a frame error exists in the signal; and

the signal-to-interference ratio reference value is increased by SIRinc if a frame error is detected, the signal-to-interference ratio reference value is decreased by SIRdec if no frame error is detected, and a product of a ratio of a target value of a frame error rate to a value smaller than the target value of the frame error rate by one and SIRinc is set as SIRdec.

84. A transmission power control method according to a claim 82 or 83, characterized in that upper and lower

85. A transmission power control method according to claim 82 or 83, characterized in that error detection information is a Cyclic Redundancy Check code.

a signal-to-interference ratio of a signal transmitted from a remote station is compared with a signal-to-interference ratio reference value, every time a slot is received, and a control instruction is generated and transmitted to the remote station;

the signal-to-interference ratio reference value is increased by SIRinc if a frame error is detected, the signal-to-interference ratio reference value is decreased by SIRdec if no frame error is detected, and a product of a target value of a frame error rate and SIRinc is set as SIRdec.

a signal-to-interference ratio of a signal
25 transmitted from a remote station is compared with a

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that:

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control on the remote station, and the number of bits in error is checked; and

the control target value is increased in accordance with the number of bits in error and decreased in accordance with the number of bits not in error.

91. A transmission power control method characterized in that:

reception quality of a signal transmitted from a mobile station is compared with a control target value, the comparison result is used for transmission power control on a base station, and the number of bits in error is checked; and

the control target value is increased in accordance with the number of bits in error and decreased in accordance with the number of bits not in error.

92. A transmission power control method characterized in that:

reception quality of a signal transmitted from a base station is compared with a control target value, the comparison result is used for transmission power control on a mobile station, and the number of bits in error is checked; and

the control target value is increased in accordance with the number of bits in error and decreased in accordance with the number of bits not in error.

reception quality of a signal transmitted from a remote station is compared with a control target value, the comparison result is used for transmission power control on the remote station, and the number of bits in error is checked; and

94. A mobile station characterized in that:

reception quality of a signal transmitted from a base station is compared with a control target value, the comparison result is used for transmission power control on the base station, and the number of bits in error is checked, and

the control target value is increased in accordance with the number of bits in error and decreased in accordance with the number of bits not in error.

20 95. A base station characterized in that:

reception quality of a signal transmitted from a mobile station is compared with a control target value, the comparison result is used for transmission power control on the mobile station, and the number of bits in error is checked, and

the control target value is increased in accordance with the number of bits in error and decreased in accordance with the number of bits not in error.

96. A control station characterized in that:

5 diversity synthesis of signals from a mobile station which are received by a plurality of base stations, and the number of bits in error in the synthesized signal is checked, and

10 a control target value for controlling transmission power of the mobile station is increased in accordance with the number of bits in error and decreased in accordance with the number of bits not in error.

97. A transmission power control method in a mobile communication system, characterized in that:

15 reception quality of a transmitted signal is compared with a predetermined control target value, and the comparison result is used for transmission power control on a remote station; and

20 it is checked whether a frame error exist in the signal, the control target value is increased if a frame error is detected, and the control target value is decreased if no frame error is detected.

98. A transmission power control apparatus in a mobile communication system, characterized in that:

25 reception quality of a transmitted signal is compared

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it is checked whether a frame error exist in the
5 signal, the control target value is increased if a frame
error is detected, and the control target value is
decreased if no frame error is detected.